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AUTOMATION: What's Ahead?

Our country owes its remarkable economic growth and its unsurpassed standard of living to the skill with which we've dreamed up and put to practical use technological advances on our farms and in our factories. Our ability to find faster and better ways of doing things has become a national trait. We pride ourselves on our "Yankee ingenuity."

Even so, plenty of people aren't so sure that further technological progress will prove an unmixed blessing. They particularly wonder about that feature of it which we call "automation." Yet automation is only a new word for something we've always believed in — inventing ways of making things quicker and cheaper so that there will be greater abundance for everyone.

Why then is there fear of automation along with approval? The answer is that we have learned how to make machines that are entirely automatic.

Doesn't this mean that machines will be taking over many people's jobs? Going a step further, a few imaginative persons have prophesied a streamlined world run by robots — a world in which the human spirit with its love of freedom and its belief in the worth and dignity of the individual will no longer count.

But experts on the subject, both from a practical and theoretical standpoint, insist that automation will mean more jobs, not fewer. They insist that it will enrich our lives, not degrade them. They point out that in the next ten years we will need 40% more productivity than we now have, while, in the face of this, our labor force will increase by only 13%. They maintain that unless this serious labor shortage is counteracted by an increase in automation, we will be confronted by a declining standard of living.

From this point of view, it looks as though automation is sure to come. Already many types of manufacture have introduced plenty of it. As the trend goes on, it's bound to bring its own particular benefits. And it's also bound to raise serious social and economic problems.

What about those factory and office workers whose present jobs will be taken over by machines? In new work, won't they have to acquire new skills in order to fit successfully into the new scheme of things?

Moreover, won't our present management, production, distributional, and marketing systems become increasingly obsolete? Doesn't this mean that businessmen will have to develop and master new techniques and concepts?

The truth is that the progress we make in receiving the benefits of automation will depend, not just on technological advances, but on what we can do to overcome social and economic stumbling blocks along the way.

This is the true vital issue we must solve.

To most of us automation still seems shrouded in mystery. How is it used? What are the facts we must face?

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IS AUTOMATION SOMETHING NEW?

Automation is both new and old. It is a new tool in mankind's agelong search for better ways to produce the things he needs. Man invented the plow — and moved further ahead

from his primitive hunting stage. He devised the wheel —one of his greatest inventions—for moving carts, for making pottery, for milling and spinning. He invented the loom for weaving cloth. He learned the use of copper, bronze, and iron, and in some places there appeared handicraftsmen of superb artistry and skill. We still marvel at early Egyptian jewelry, Greek pottery, and Etruscan bronzes. Thus man helped himself to get civilized through making things he and other men could use.

But in ancient days goods were produced in a large degree by slave labor. And in early medieval times they were produced by serfs — men who were bound to their land and their jobs by feudal overlords. Neither situation was much fun for the average human being. He had little real incentive to produce. He did not fully enjoy the fruits of his labor.

As commerce picked up, towns began to grow, and the number of freemen increased. Goods were manufactured by independent craftsmen who sold them right at their shops. Each trade banded together into a guild and strictly controlled the number of members and the quality and price of the articles they made.

The guild system of production worked fine while towns were practically little governments unto themselves. But as great nations came into being and the modern world was born, the craftsman guilds couldn't provide enough goods for home consumption or international trade. Enterprising men began to farm out raw materials to groups of workmen in their homes. This method of production was known as the domestic system.

Around 1750, there came a quickening of men's ingenuity to build machines — run first by hand, then by waterpower — which increased the productivity of the individual worker. In 1764, Hargreaves, an Englishman, invented the spinning jenny which enabled a single operator to spin several threads at one time. In 1785, Cartwright invented the power loom.

By 1788 Watt had perfected his steam engine. An American, Eli Whitney, in 1790 invented the cotton gin. In doing so, he hit on the idea of interchangeable parts — the key to mass output. So the stage was set for a new type of production — workers under one roof operating power driven machinery. Thus the factory system was born.

The Industrial Revolution brought about by the factory system raised many problems, such as a shift of workers from the farm to the factory, child labor, city slums. These had to be faced — and not all have been satisfactorily met even yet.

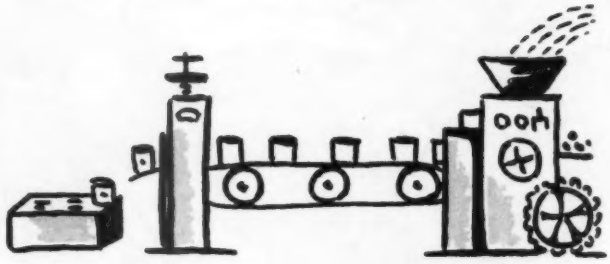
With the tremendous economic expansion that followed the Civil War, the American Industrial Revolution moved into full swing.

By the end of World War One, we were the most heavily mechanized country in the world.

And with the growth of the automobile industry during the twenties, the assembly line came into its own. But at the same time, work became more and more routine. Lightening the repetitive drudgery of much of it became one of the problems calling for attention.

The enormous demand for military equipment during World War Two speeded the development of high-production machines. They became semi-automatic. The operator turned the machine on and off, fed in raw stock, took out finished parts, and watched for slip-ups.

Also during the war our scientists and engineers designed new electronic devices that would automatically guide guns and airplanes. After the war it was obvious that these electronic controls could be applied to semi-automatic production machines to make them fully automatic. Automation was



here. Some people have called it the Second Industrial Revolution.

HOW IS AUTOMATION USED?

Automation has two principal uses — shaping materials and processing information. The first applies to manufacturing, the second to management.

IN MANUFACTURING

In manufacturing, automation means the use of machines which are self-correcting. Through the "feed-back" principle, the machine is designed to check itself, to compensate for its own errors, and to follow through a sequence of logical operations. Human "brain power" is not needed.

A further aspect of automation in manufacturing is the automatic transferring of materials (solids or liquids) from one machine to another. The raw material enters one end of the plant, goes through a continuous process untouched by human hands, and comes out as a finished product. This is the ideal of the automatic factory.

While the automatic factory is still largely theoretical, many successful automatic machines are already in use in manufacturing — lathes, screw machines, milling machines, drills, punch presses. In addition, there is automatic inspection, testing, sorting, weighing, and packaging. In some industries (notably refining, but also bottle making, tin cans, paper, light bulbs, radio tubes, cigarettes) the continuous process — or the automatic factory principle — has been developed to a high degree. And through the development of punched paper tapes, on which blueprint designs can be recorded and fed directly into the machine, the future of automation in manufacturing looks bright indeed.

IN MANAGEMENT

In management, automation means the use of computing machines or "electronic brains" to process data. In a matter of minutes, these machines can make accurate tabulations and computations that would take skilled human beings hours of hard work to complete. Automation in management also means the instantaneous selection of this information and the delivery

of it to the appropriate places by electronic communications.

Although this aspect of automation has not been advanced to any great degree, electronic computing machines are being adopted widely for tabulating and processing information in all types of industrial corporations and in railroads, banks, and insurance companies, not to mention government offices and mercantile companies.

Automation is certainly here, and it is here to stay.

WHY AUTOMATION?

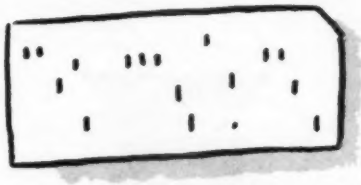
But why have people concerned with manufacturing and management problems adopted automation?

The answer is simple. It pays.

The main problems in manufacturing are volume and cost per unit volume. Automation helps solve both of these. As the number of articles a single machine can produce each day goes up, the cost of each article comes down. But cost also involves the wages of the operator, the number of parts that are spoiled, the time it takes to make adjustments. Automatic machines eliminate the operator, have little or no spoilage, and adjust themselves. Thus they produce more parts more accurately.

The same applies to computing machines. They turn out more information more accurately. Businesses today must handle a vast amount of figures just to carry out their routine work such as payroll, taxes, and billing. They also need all kinds of data to make decisions and plans — production and inventory figures, sales and market statistics. Automation speeds routine bookkeeping and enables management to give better service. In addition, the accurate and quick information it provides, some of which was never available before, enables management to make better decisions and sounder, more reliable plans.

Besides merely computing, automation can add to the efficiency of management by instantly transmitting processed data to those who need it. A good example is what one stock brokerage firm does. When a branch office customer buys or sells a stock, all the arithmetic involved is computed in a few seconds on a giant "electronic brain" located in New York.



This information is transferred to a punched paper tape, fed into a teletype machine, and flashed to the customer's office almost instantly, no matter how far away it might be.

HOW WILL AUTOMATION AFFECT WORKERS?

We have seen how and why automation is used. But what about the people it displaces? Will it create a serious unemployment problem?

In the long run, it shouldn't. Quite the reverse, automation should make for more and better jobs, rather than fewer. But till there's been time for adjustment, automation can bring hardship, especially to older people who have done routine factory or office work for years and find it hard or impossible to learn new ways.

But once automation becomes established, it should help to make factory and office life more pleasant, for it will eliminate tedious routine jobs and will increase the demand for highly skilled technicians. Although machines will be doing the work, more and more people will be needed to keep the machines working, to build them, and to set them up for the work they have to do.

Since there is already a scarcity of labor of this caliber, management will have no choice but to train the technicians needed. For the worker, greater skill means better pay. Thus automation should upgrade labor.

Also because with automation more goods can be made more cheaply, the market for many types of things should expand. As a consequence, corporations will grow. Hence

more jobs — not fewer — should be created.

Yet though automation promises labor a higher status, more opportunity for self-government, more pay, and more jobs, unions are inclined to fear that automation may reduce their bargaining power. But manufacturers who may introduce automation for this reason are fooling themselves. Automation costs money. It also tightens competition. These circumstances make it pretty expensive to allow a strike to close a plant down. For these reasons, labor's bargaining power is not likely to be impaired. The refining industry, for example, which is highly automatic, has a very stable labor record.

Finally, as far as labor is concerned, the greater productivity of automation will increase the possibility of getting a shorter work week and give the working man more leisure.

WHAT ABOUT AUTOMATION AND MANAGEMENT?

As we have seen, automation is helping management solve some of its problems by speeding bookkeeping and providing better analytical data. But it is also raising newer and, in some ways, tougher problems. Factory production systems are having to be changed to utilize automatic machinery. Products are having to be redesigned. Training programs for technicians and even for engineers and designers are becoming a necessary cost.

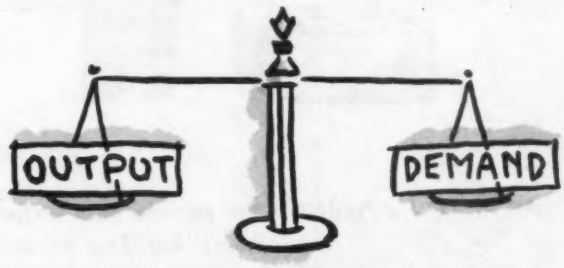
Besides these problems within the plant, management is having to revise its techniques of marketing and distribution, since automation will allow much less fluctuation in output. The market will have to be much more predictable and definite than it ever has been.

All of this indicates that automation will bring some radical changes to the economics of the average business firm. The managers of our free enterprise system are coming up against one of the biggest challenges they have ever faced.

HOW WILL THIS NEW WAY OF MAKING THINGS AFFECT US?

Because of the great expense of installing it and because of the nature of automatic production equipment, it seems likely that in the coming years we will have to accept even more standardization in what we use than we have now.

However, though this may be a drawback, automation will



benefit us with a more stable economy. Today, when a businessman finds goods piling up in his warehouse, he cuts production and lays off workers. But as automation advances, he is going to find that he can't save money by shutting down

part of his plant, and he will have to reduce his inventory by harder selling. Thus we will tend to move away from the "boom and bust" cycles that have always troubled us. We'll have more job security.

But the greatest boon of automation is that by its remarkable capacity to make more things available at a lower price it should bring us a better living standard. Moreover, with machines taking over much of our work load, mankind at last may be achieving what he has always yearned for — the leisure for living itself.

This however will bring us squarely up against still another problem. What shall we do with our leisure time?

We're a nation of workers. We look upon work as a virtue to be cultivated and idleness as a sin. Yet aren't many of our social ills aggravated by the fact that we have too little time left over from our work for other important things? Parents need more time to be with their children. We need more time to take part in worthwhile civic and cultural activities.

If we learn to use the coming increase in our leisure wisely, we can become a happier and better society.

If we don't, boredom may become a source of national frustration and instability.

HOW FAST WILL AUTOMATION BE APPLIED?

While the application of this new technique of producing the things we need should give us a sounder, more abundant economy, we certainly are not going to have it overnight. For one thing, industries which have invested millions of dollars in plant equipment and have spent years in developing their manufacturing methods are not going to scrap everything for something new. They will introduce automation gradually, wherever they think it will pay. Also some industries simply do not lend themselves to automation, particularly those which produce in small lots.

Another drag on automation is the lack of trained technicians and of instrument, design, and production engineers. Lack of knowledge and experience is still another barrier, for there are many technical problems involved in the advancement of automation, and they will take time to solve.

Finally, there is always the matter of money. The high cost of automatic machinery means that industry will have to raise large amounts of capital. And until the public becomes more interested in buying stocks and bonds, to finance such installations, this will not be easy to do.

No matter how perplexing the obstacles in the way of automation may seem to be — the inertia of management, the distrust of labor, the lack of personnel, of know-how, and of money — they are all things we'll be called on to help overcome. Our population is growing rapidly — more rapidly than our ability to produce what it needs. Unless we are willing to accept a lower living standard, automation looks like a must.

Here are some of the questions raised by automation which deserve being thought about and discussed:

1. What shall we do with regard to factory and office workers displaced by automation who may be too old to learn new skills or who do not have the aptitude to do so? Would some sort of pension plan be one solution? What are others?
2. What means can we suggest to train new technicians and engineers? Should we persuade more people to attend technical and engineering schools? What about government scholarships or scholarships from industry?
3. Can we think of more ways to increase the amount of money available to industry for investment in automatic equipment? If so, let's consider them. Should our tax laws be changed, or would this be favoring "big business"?
4. Do we, or do we not, believe that the shorter work week is a good thing? What do we suggest for the use of leisure time? Are there any important things we have neglected because work has used up most of our time and energy?
5. How do we feel about our present system of distributing and marketing our products? Is, or is not, the difference between the factory price and the store price too much? Why does automation lead us to think about these things?

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